IN THE CLAIMS

1. (Currently Amended) A method for producing a buried tunnel junction ~~(1)~~ in a surface-emitting semi-conductor laser having an active zone ~~(5)~~ with a pn-junction surrounded by a first n-doped semi-conductor layer ~~(6)~~ and at least one p-doped semi-conductor layer ~~(3, 4)~~ and having a tunnel junction ~~(1)~~ on the p-side of the active zone ~~(5)~~, which borders on a second n-doped semi-conductor layer ~~(2), wherein the layer destined for the tunnel junction (1) is laterally ablated in a first step by means of~~, comprising:

laterally ablating tunnel junction material, by material-selective etching ~~up~~ to a desired diameter of the tunnel junction ~~(1) and in a second step is heated~~; and

heating the semi-conductor in a suitable atmosphere~~,~~ until ~~the~~an etched gap formed by the ablating procedure is closed by mass transport from at least one semi-conductor layer ~~(2, 3)~~ bordering ~~on~~ the tunnel junction ~~(1)~~.

2. (Currently Amended) The method according to ~~Claim~~claim 1, wherein at least one of the semi-conductor layers ~~(2, 3)~~ bordering ~~on~~ the tunnel junction ~~(1) consists of~~comprises a phosphide compound~~, preferably consisting of InP~~.

3. (Currently Amended) The method according to ~~Claim 1 or 2,~~claim 1, wherein ~~as~~the suitable atmosphere ~~in the said second step~~comprises a phosphoric atmosphere~~, preferably PH_3 and hydrogen, is used~~.

4. (Currently Amended) The method according to ~~one of Claims 1 to 3,~~claim 1, wherein ~~the~~heating is in a temperature ~~in the said second step is chosen to be between 500 and 800 °C , preferably between 500 and 600~~range of about 500 to 800 °C.

5. (Currently Amended) The method according to ~~one of Claims 1 to 4, wherein,~~ claim 1, further comprising:

starting with an epitaxial initial structure ~~of~~on the surface-emitting semi-conductor laser~~, in which~~;

sequencially applying a p-doped semi-conductor layer ~~(3), the layer destined for~~, the tunnel junction ~~(1),~~layer and the second n-doped semi-conductor layer ~~(2) are applied sequentially~~ on the p-side of the active zone ~~(5), ~~; and

using photolithography and / or etching to form a circular or ellipsoid stamp ~~is formed, whose~~having flanks ~~encompass~~ enclosing the second n-doped semi-conductor layer ~~(2)~~ and ~~the layer destined for~~ the tunnel junction ~~(1)~~layer and ~~extend~~extending at least to underneath the ~~layer destined for the~~ tunnel junction ~~(1), and, subsequently, said first and said second step are embodied for producing the buried tunnel junction (1)~~layer.

6. (Currently Amended) The method according to ~~one of Claims 1 to 5, wherein~~ claim 1, further comprising applying an additional semi-conductor layer ~~(21) adjoins~~ to the second n-doped semi-conductor layer ~~(2)~~ at the p-side of the active zone ~~(5), said~~, the additional semi-conductor layer ~~(21) in turn borders on~~bordering a third n-doped semi-conductor layer ~~(2'), whereby this~~, wherein the additional semi-conductor layer ~~(21)~~ is laterally ablated ~~up~~ to a desired diameter by ~~means of~~ material-selective etching and ~~then is~~subsequently heated in a suitable atmosphere until ~~the~~an etched gap formed by the ablating procedure is closed by mass transport from at least one of the semi-conductor layers ~~(2, 2')~~ bordering ~~on~~ the additonal semi-conductor layer ~~(21)~~.

7. (Currently Amended) The method according to ~~Claim~~claim 6, wherein different semi-conductors are used for the additional semi-conductor layer ~~(21)~~ and for the tunnel junction ~~(1)~~.

8. (Currently Amended) The method according to ~~Claim~~claim 7, wherein InGaAsP is used for the additional semi-conductor layer ~~(21)~~ and InGaAs is used for the tunnel junction ~~(1)~~.

9. (Currently Amended) The method according to ~~one of Claims 6 to 8,~~claim 6, wherein the additional semi-conductor layer ~~(21)~~ is arranged in a maximum of ~~the~~a longitudinal electrical field, while the tunnel junction ~~(1)~~ is in a minimum of the longitudinal electrical field.

10. (Currently Amended) The method according to ~~one of Claims 1 to 9,~~claim 1, wherein ~~for the~~a material-selective etching solution is $H_2S0_4 : H_20_2 : H_2O$ ~~is~~ used ~~as the etching solution~~ in a ratio of 3:1:1 to 3:1:20, if the tunnel junction ~~(1)~~ is comprised of InGaAs, InGaAsP or InGaAlAs.

11. (Currently Amended) A surface-emitting semi-conductor laser having an active zone ~~(5)~~ with a pn-junction surrounded by a first n-doped semi-conductor layer ~~(6)~~ and at least one p-doped semi-conductor layer ~~(3, 4)~~, and a tunnel junction ~~(1)~~ on the p-side of the active zone ~~(5)~~, which borders ~~on~~ a second n-doped semi-conductor layer ~~(2)~~, wherein the tunnel junction ~~(1)~~ is laterally ~~embraced~~flanked by a zone ~~(1a)~~, which connects the second n-doped semi-conductor layer ~~(2)~~ with one of the p-doped semi-conductor layers ~~(3, 4)~~ and which is formed from at least one of these adjacent layers ~~(2, 3)~~ by mass transport.

12. (Currently Amended) ~~A~~The surface-emitting semi-conductor laser according to ~~Claim~~claim 11, wherein at least one of the semi-conductor layers ~~(2, 3)~~ bordering ~~on~~ the tunnel junction ~~(1) consists of~~comprises a phosphide compound~~, preferably consisting of InP~~.

13. (Currently Amended) ~~A~~ The surface-emitting semi-conductor laser according to ~~Claim 11 or 12, characterized in that a p-doped InAlAs layer (4) as the at least one~~ claim 11, wherein the p-doped semi-conductor layer ~~followed~~comprises InAlAs which is flanked by a p-doped InP layer ~~(3) abuts with~~and the active zone ~~(5)~~.

14. (Currently Amended) The surface-emitting semi-conductor laser according to ~~one of Claims 11 to 13,~~claim 11, wherein the tunnel junction ~~(1)~~ is arranged in a minimum of ~~the~~a longitudinal electrical field.

15. (Currently Amended) The surface-emitting semi-conductor laser according to ~~one of Claims 11 to 14,~~claim 11, wherein an additional n-doped semi-conductor layer ~~(6a)~~ is present between the active zone ~~(5)~~ and the first n-doped semi-conductor layer ~~(6)~~, which is configured as a semi-conductor mirror.

16. (Currently Amended) The surface-emitting semi-conductor laser according to ~~one of Claims 11 to 15,~~claim 11, wherein an additional semi-conductor layer ~~(21)~~ is present, which abuts ~~on~~ the second n-doped semi-conductor layer ~~(2)~~ bordering ~~on~~ the tunnel junction ~~(1)~~ and which itself borders ~~on~~ a third n-doped semiconductor layer ~~(2')~~, whereby this additional semi-conductor layer ~~(21)~~ is laterally surrounded by a zone ~~(20),~~ that connects the second n-doped semi-conductor layer ~~(2)~~ with the third n-

doped semi-conductor layer ~~(2')~~ and is generated by mass transport from at least one of these two layers ~~(2, 2')~~.

17. (Currently Amended) The surface-emitting semi-conductor laser according to ~~Claim~~claim 16, wherein the refractive index of the additional semi-conductor layer ~~(21)~~ differs from ~~the one or~~ those of the ~~two surrounding layers (2, 2').~~ second n-doped semi-conductor layer and the third n-doped semi-conductor layer.

18. (Currently Amended) A surface emitting semi-conductor laser according to ~~Claim 16 or 17,~~claim 16, wherein the additional semi-conductor layer ~~(21)~~ is arranged in a maximum of ~~the~~a longitudinal electrical field.

19. (Currently Amended) The surface emitting semi-conductor laser according to ~~one of Claims 16 to 18,~~claim 16, wherein the additional semi-conductor layer ~~(21)~~ and the tunnel junction ~~(1)~~ are comprised of different semi-conductor materials.

20. (Currently Amended) The surface-emitting semi-conductor laser according to ~~Claim~~claim 19, wherein the additional semi-conductor layer ~~(21)~~ is comprised of InGaAsP and the tunnel junction ~~(1)~~is comprised of InGaAs.

21. (Currently Amended) The surface-emitting semi-conductor laser according to ~~one of Claims 16 to 20,~~claim 16, wherein the diameter of the additional semi-conductor layer ~~(21)~~ is greater than that of the tunnel junction ~~(1)~~.

22. (Currently Amended) The surface-emitting semi-conductor laser according to ~~one of Claims 16 to 21,~~claim 16, wherein the band gap of the additional semi-conductor layer ~~(21)~~ is greater than the band gap of the ~~activation~~active zone ~~(5)~~.

23. (New) The method according to claim 1, wherein at least one of the semi-conductor layers bordering the tunnel junction comprises InP.

24. (New) The method according to claim 1, wherein the suitable atmosphere comprises a mixture of PH_3 and hydrogen.

25. (New) The method according to claim 1, wherein heating is in a temperature range of about 500 to 600 °C.

26. (New) The surface-emitting semi-conductor laser according to claim 11, wherein at least one of the semi-conductor layers bordering the tunnel junction comprises InP.

IN THE DRAWINGS

The attached sheets of drawings include changes to FIGS. 1, 2, 9 and 10. These sheets replace the original sheets including FIGS. 1 through 10.

ATTACHMENTS: 5 REPLACEMENT SHEETS.